

**Method and computer device
for automatically reproducing digital audio data**

The invention pertains to the field of methods and computer equipment by which digital audio data can be reproduced automatically.

Digital audio data may be based, for instance, on speech data which are recorded by a microphone means coupled to a computer device and which are then stored in electronic form in a memory means included in the computer equipment. The electronically memorized digital audio data are reproduced either by the same computer device or by any other reproducing means, through a suitable loudspeaker. Thus it has become possible in a wide variety of applications, for instance, during work in the legal or medical professions, to dictate and have the dictation first stored electronically by means of the computer device in the form of digital audio data and, later on, have it emitted as audio signals either by the same computer device or by any other reproducing means. As the digital audio data are output by the reproducing means, a person, such as a secretary, being a user of a write program installed ready for execution in the computer device, writes in order to obtain a written text which corresponds to the dictation. The user, when writing, actuates a switch or pedal with his/her foot in order to control the reproduction of the digital audio data, especially as regards the beginning, interruption, and end of reproduced sections of the dictation. Such a foot-operated switch or pedal must be purchased in addition to the computer equipment and connected electrically to the same.

Application of a foot-operated switch in combination with the write program installed in the computer device, as a rule, requires professional skill of which trained secretarial staff disposes. Unskilled persons, on the other hand, normally are not capable of properly coordinating the reproduction of the digitally stored dictated data and the writing of the dictation to be reproduced, by actuating the foot-operated switch.

It is, therefore, an object of the present invention to provide an improved method and an improved computer device for automatically reproducing digital audio data by way of an audio data reproducing means, in particular for automatically reproducing dictated data which are stored in electronic form. The method and device are to allow also untrained users to combine reproducing of the digital audio data and writing with the assistance of a write program, at little expenditure.

These objects are met, in accordance with the invention, by a method as recited in independent claim 1 and a computer device as recited in independent claim 6.

The invention embraces the concept of using a computer device for automatically reproducing digital audio data via an audio data reproducing means, especially for automatically reproducing dictated data which are stored in electronic form. The computer device comprises a memory means for storing the digital audio data, an input means including a keyboard for detecting user inputs, a display means for the output of electronic image information, and a control unit to control and/or monitor electronic data transfers between the audio data reproducing means, the memory means, the input means with its keyboard, the display means, and/or the control unit. A respective predetermined functionality, in connection with the automatic reproduction of the digital audio data via the audio data reproducing means, is electronically assigned to plural key members of the keyboard. This is accomplished by making use of the control unit. When the control unit electronically detects that one of the plurality of key members of the keyboard has been actuated, the control unit accesses the digital audio data stored in the memory means, based on the predetermined functionality of the one of the plural key members, and automatically causes the digital audio data to be reproduced by the audio data reproducing means. For a predetermined period of time t , at first, audio signals TS_1 are output which correspond at least to a subset TM_1 of the digital audio data. At periodic intervals, the control unit automatically checks whether write data in connection with a write program executed in the computer device that were input via the keyboard

during the output of the audio signals TS1 can be detected. If, upon completion of the output of the audio signals TS1, the control unit detects write data in connection with the write program executed in the computer device that were entered by way of the keyboard, the
5 control unit automatically causes further audio signals TS2, corresponding to another subset TM2 which follows the subset TM1 in the stored digital audio data, to be output via the audio data reproducing means for the predetermined period of time t, immediately upon completion of the output of audio signals TS1. If not, the
10 reproduction of the digital audio data via the audio data reproducing means is interrupted automatically.

In this manner the user of the computer device is enabled, on the one hand, to control reproduction of the digital audio data with ease by actuating key members of the keyboard in order to trigger
15 the reproduction at least of subsets of the audio data by pushing a button. And, on the other hand, to enter write data while the digital audio data are being reproduced. All this can be done without the need for an untrained user to employ a rather difficult foot-operated switch. Dictation data thus can be reproduced automatically without having the computer device equipped with a foot-operated switch which would involve extra costs. Also, the user's
20 writing speed can be allowed for automatically since reproduction of the digital audio data will be interrupted automatically if no entry of write data is detected at the end of the output of a certain quantity of audio signals. The reason for this measure is that an untrained user's input in terms of writing speed, as a rule, cannot follow the reproduction speed of the digital audio data. The user consequently will interrupt the input of write data. And in that event also the reproduction of audio data is stopped automatically.
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30 Electronic assignment of the predetermined functionality to the plurality of key members of the keyboard permits different functionalities to be associated with different key members. Actuating different key members, therefore, releases the automatic reproduction of digital audio data which belong to different time portions. By operating the keyboard, the user in this manner can
35 adjust the reproduction to his/her capability of writing texts. The

invention thus not only helps save costs for a foot-operated switch which normally would be required, it also simplifies handling of the computer device. Even persons who are not skilled keyboard typists are given the chance to benefit from automatic reproductions of 5 dictations to write the dictated text.

A convenient further development of the invention provides for interruption of the reproduction of the digital audio data by the audio data reproducing means for a predetermined period of interruption t_u , and for the further audio signals T_{S2} to be output 10 automatically subsequent to the period of interruption t_u . In this manner the reproduction of the digital audio data can be resumed automatically after a predetermined period of interruption without the need to first having to detect a user reaction. The length of time of the interruption can be adjusted in accordance with the 15 user's writing capabilities. For untrained users, the period of interruption will be somewhere in the range of several seconds.

In a modification of the invention, intended to improve possibilities of individual adjustment of the method to the wishes of users, it may be provided that the predetermined period of time t is 20 automatically set differently by means of the control unit, depending on the electronic determination of which one of the plurality of key members of the keyboard was actuated.

An embodiment of the invention, especially advantageous for use of the method in combination with mobile computing equipment, provides 25 for the keyboard to be designed, with the aid of the control unit, as a display keypad on the display means. Actuation of the plural key members and the input of write data, by means of the display keypad, in connection with the write program executed in the computer device are detected electronically by the control unit.

30 According to a preferred further development of the invention electronic text data are shown on the display means in the course of the reproduction of the digital audio data via the audio data reproducing means, said electronic text data corresponding to electronic speech recognition data which were generated automatic-

cally by a speech recognition means on the basis of the digital audio data. This gives the user the option of utilizing electronic speech recognition in combination with the method. With this embodiment, the write data entered by the user by way of the 5 keyboard and detected by means of the computer device, normally, relate to corrections of the electronic text data generated by speech recognition which are displayed on the display means and correspond to a text presentation of the digital audio data reproduced.

10 The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic presentation of a computer device for carrying out the method of automatically reproducing digital audio data;

15 Fig. 2 is a diagrammatic presentation of part of a display surface;

Fig. 3 is a diagrammatic presentation of an integrated computer device on which a display keypad is shown;

20 Fig. 4 is a flowchart comprising steps of the method of automatically reproducing digital audio data; and

Fig. 5 is a diagrammatic presentation of another computer device for carrying out the method of automatically reproducing digital audio data, comprising an electronic speech 25 recognition means.

Fig. 1 diagrammatically shows a computer device 1 comprising a control unit 2 which is connected to a display means 3 for the output of electronic image information, a microphone means 4 for entering speech data, a loudspeaker means 5 for reproducing audio data, and a keyboard 6. The control unit 2 serves to control and/or monitor electronic data transfers between the control unit 2, the display means 3, the microphone means 4, the loudspeaker means 5, and/or the keyboard 6. The control unit 2 comprises a processor means 7 and a memory means 8, as is conventional with microprocessor based systems. The computer device 1 diagrammatically shown in fig. 30 1 may be a conventional desktop computer, a laptop computer, or any 35

other mobile computer device disposing of the elements described above; it may also be a pocket computer or an electronic pocket diary system.

The presentation in fig. 1 is diagrammatic^yin the sense that the
5 display means 3, the microphone means 4, the loudspeaker means 5,
and/or the keyboard 6 may in fact be integrated together with the
control unit 2 in a common casing. The particular arrangement of the
individual component groups is not critical to the invention. For
instance, the microphone means 4 at the computer device 1 may be
10 omitted and digital audio data recorded by other means and then
passed on to the computer device 1 by data transfer.

The keyboard 6 includes a plurality of key members arranged in a so-called function key block 9. Therefore, the key members arranged in
the function key block 9 also are referred to as function keys F1
15 ... F2. As already practiced in connection with known computer
programs, the function keys each may be assigned a predetermined
functionality by the control unit 2. When a function key is
actuated, the functionality electronically assigned to it will be
executed automatically. For example, a program installed in the
20 computer device 1 is executed while the control unit 2 performs its
controlling and coordinating of the automatic course of individual
steps.

The computer device 1 may be used to carry out a program for the
reproduction of digital audio data, as may be gathered at least in
25 part from the flowchart shown diagrammatically in fig. 4. The memory
means 8 holds digital audio data in electronic form which either
were recorded by way of the microphone means 4 or transferred
directly to the memory means 8 by electronic data transfer. The
digital audio data preferably are speech data (dictation) entered by
30 a user, such as a dictated letter. By starting a reproduction
program installed in the computer device 1, the user can trigger the
output of the digital audio data stored in the memory means 8 which
thus will be emitted as audio signals from the loudspeaker means 5.
Beforehand, a predetermined functionality had been assigned
35 electronically to a plurality of function keys of the keyboard 6 by

the control unit 2 so that actuation of one of the function keys will result in the output of a first subset TM1 of the digital audio data from the loudspeaker means 5 in the form of audio signals TS1. Due to the predetermined functionality of the function key, the 5 first subset TM1 comprises so many audio data that the audio signals TS1 will be reproduced for a predetermined period of time t. During reproduction of the digital audio data, the control unit 2 checks whether write data entered by the user through the keyboard 6 can be detected, such data being input by the user to write a text 20 (cf. 10 fig. 2) in a write program 21 which is executed by the computer device 1. The write program is shown diagrammatically in fig. 2 as an open window on a display surface 22. In the case where the reproduced digital audio data are based on a dictation of a letter, the text 20 in the write program 21 corresponds to the dictated 15 letter.

If the control unit 2 determines, at the end of the reproduction of the first audio signals TS1, that the user is putting the keyboard 6 to use for inputting data in connection with the write program 21, a second subset TM2 of the digital audio data in the form of second 20 audio signals TS2 will be reproduced for the predetermined period of time t by the loud-speaker means 5, immediately following the end of the reproduction of the first audio signals TS1. This automatic way of proceeding is based on the assumption that the user, with his/her writing speed, can follow the dictation as reproduced through the 25 loudspeaker means 5. Should the user interrupt the entering of write data via the keyboard 6 because he/she cannot follow the dictation as reproduced, the reproduction of the digital audio data through the loudspeaker means 5 is interrupted for a predetermined interruption period tu when the reproduction of the first audio 30 signals TS1 has been completed. This is a way of giving the user a chance of subsequently writing dictation sequences still comprised by the first audio signals TS1. After the predetermined interruption period tu, which may last no more than one or several seconds, the second subset TM2 in the form of second audio signals TS2 is 35 reproduced through the loudspeaker means 5. At the end of the reproduction of the second audio signals TS2 the control unit 2 operates in analogous manner as at the end of the reproduction of

the first audio signals TS1 to reproduce the further digital audio data.

The predetermined interruption period tu is individually adjustable by the user. Typically, a parameter option is offered as usual
5 within the reproduction program implemented in the computer device 1.

Fig. 3 diagrammatically shows a display surface 30 on which a display keypad 31 is shown. Usually, the display keypad 31 comprises the same kind of elements as the keyboard 6, in any case at least a
10 function key block 9. In analogy to the keyboard 6, the display keypad 31 can be used in connection with the method described above for automatically reproducing digital audio data. Either a mouse pointer 32 or an electronic pointer means (not shown) may be used to actuate the key members of the display keypad 31 with which the
15 pointer will interact electronically as the display keypad 31 is touched or approached. It is likewise possible to use any kind of touchscreen display. With the computer device 1, the display keypad 31 may be used alone or in combination with the keyboard 6.

A further development of the method described provides for the
20 control unit 2 to be connected to an electronic speech recognition means 10, as illustrated in fig. 5. The electronic speech recognition means 10 serves to automatically convert electronic speech data into text data. Various speech or voice recognition programs are available to accomplish that and they can be executed
25 in any kind of computer system. The particular embodiment of the speech recognition program applied is not critical to the invention. When the digital audio data held in the memory means 8 have been processed by the electronic speech recognition means 10, text data generated from the audio data with the aid of the speech recognition
30 means 10 can be shown on the display means 3, while the digital audio data are being reproduced by the loudspeaker means 5. Under these circumstances the write data entered by the user either by way of the keyboard 6 or the display keypad 31 in the method described above, usually relate to corrections to be made in the text data
35 displayed on the display means 3. Here, the user has the opportunity

to read text data from the display means 3, while the digital audio data comprising, for instance, a dictated letter are being reproduced via the loudspeaker means 5. Like the other components of the computer device, the electronic speech recognition means 10 may 5 be integrated in a casing together with the control unit 2. However, often server means disposing of sufficient processing capacity are used as the means for speech recognition.

The features of the invention disclosed in the specification above, in the claims, and in the drawing may be significant to implementing 10 the invention in its various embodiments, both individually and in any combination.